Chapter 5
CONCLUSIONS

GENERAL

- Minimum Flows and Levels (MFLs) were developed to prevent significant harm from occurring to the Caloosahatchee River and estuary.
- Structural changes or alterations that have occurred to the Caloosahatchee River and its watershed, the effects of these changes, and the constraints they impose on the water resource were considered as part of the process for developing the proposed MFL.
- Significant harm is defined as loss of a specific water resource functions that take multiple years to recover, which result from a change in surface or groundwater hydrology.

SYSTEM COMPONENTS AND FUNCTIONS

- Four components of the Caloosahatchee River system were identified that are affected by the need to establish Minimum Flows and Levels (MFLs). These components and their identified water resource functions were:

    1. Lake Okeechobee provides water supply, flood protection, navigation, recreation, natural systems, protection of fish and wildlife habitat and water quality functions
    2. The Caloosahatchee River: provides functions of water supply, flood protection, navigation, recreation, protection of natural systems and water quality.
    3. The Caloosahatchee River watershed functions include protection of water supply, flood protection, natural systems and water quality.
    4. The functions of the Caloosahatchee River estuary include fish and willife habitat and water quality.

CONSIDERATION OF STRUCTURAL CHANGES AND ALTERATIONS

- The river, estuary and upstream watershed are highly modified from their historic condition. The River has been channelized, the watershed has been greatly expanded by connection with Lake Okeechobee and water control structures have been added to create a series of impoundment rather than a free-flowing watercourse. The present day hydrology of the system is carefully managed and regulated to ensure that navigation, water supply and drainage/flood control functions are met on a continuing basis.
- At least two functions of the River and watershed are occasionally compromised and could potentially constitute harm. These include impacts on the water supply function due to periodic deterioration of water quality (algae blooms and elevated chloride concentrations), and

impacts on the navigation and recreation functions based on the need to periodically reduce lockages through S-79. However, adequate protection is provided, in terms of operational protocols to prevent significant harm from occurring to these resources.

- The Caloosahatchee estuary is sensitive to high salinity levels and receiving sufficient water flows during the dry season. The health of this estuary is also an indicator of health of the watershed, since it receives runoff from the entire basin, and it serves as a nursery ground for many estuarine and coastal plants and animals. This estuary also has a high probability of experiencing significant harm due to lack of sufficient freshwater flows before the CERP structural solutions are complete. A proposed Caloosahatchee River and estuary MFL and associated management strategy were therefore developed, based on providing minimum flows necessary to protect the estuary from significant harm.
- Providing flows necessary to maintain a fresh/brackish water community within the estuary will also help maintain water quality conditions in the river and reduce the need to make special water releases from Lake Okeechobee or limit lockages.

TECHNICAL RELATIONSHIPS CONSIDERED IN DEFINING SIGNIFICANT HARM

Sources of Information Examined

- A Valued Ecosystem Component (VEC) approach (EPA, 1987) was used as the basis to establish a minimum flow regime at S-79 that will protect the system from significant harm.
- Several published District studies used this resource-based approach to define a preliminary estimate of optimum freshwater flows that should be delivered to the Caloosahatchee Estuary.
- Results of a literature search produced a bibliography containing approximately 300 citations.
- Review of information available concerning key species or groups of organisms that may benefit from using Vallisneria grass beds.
- Review of the District's Caloosahatchee estuarine research programs including results from field, laboratory mesocosm, and growth rate studies.

Information Analysis and Modeling

- An empirical relationship was developed between salinity at a given location in the estuary as function of flows through S-79.
- A Vallisneria growth rate algorithm was derived, to relate changes in blade length, blade density and shoot density to salinity.
- The above algorithms were converted to computer code and incorporated into the South Florida Water Management Model (SFWMM) to simulate Vallisneria growth response under current (1995) future (2020) conditions.

DEFINITION OF HARM AND SIGNIFICANT HARM

Basis for Defining Harm

- Minimum flow and level criteria for the Caloosahatchee estuary are based on protection of submerged aquatic vegetation, Vallisneria americana. Previous research concluded that many estuarine are dependent on Vallisneria grass beds during the spring (November–March). Therefore, maintaining Vallisneria shoot density during this critical time period was the focus of this evaluation.
- Definitions of harm and significant harm were developed based on predicted impacts to the habitat function of the Vallisneria community:

Levels of Harm

- Vallisneria shoot density in critical grass bed areas (between 15 and 19 mile upstream of Shell Point) may periodically fall below 20 shoots/m2 during the months of March, April and May. Such events may be stressful, but are considered to be within the range of normal fluctuation and do not constitute harm. Organisms have the ability to recover during the following wet and dry seasons in response to increased flow.
- Harm occurs if such an event happens during two consecutive years. This degree of habitat loss will impact local populations within the Caloosahatchee estuary of those species that live for one or two years and are highly dependent on this freshwater habitat during the spring months to successfully grow or reproduce.
- Significant harm occurs if the habitat function of this community is lost for three consecutive years or more. This based on the fact that many estuarine and marine species which utilize this habitat have life spans of three years or less and represent important forage organisms which support higher trophic level species. These organisms are highly dependent on this freshwater habitat during the spring months and may fail to reproduce successfully during their lifetime if this habitat is lost or reduced. Support for the levels of harm discussed above are derived from a review of the life histories of important forage species and game fish that utilize Vallisneria grass beds located within the Caloosahatchee estuary during the spring.

MFL RECOVERY AND PREVENTION STRATEGY

Because the proposed minimum flow criteria cannot be met every year under current conditions, a Recovery and Prevention Strategy is needed. District staff have identified short-term and long-term approaches to implementing the proposed MFL critieria and protecting the resource from significant harm

Short-Term Recovery Strategy

- An Adaptive Water Management Approach is recommended for the Caloosahatchee estuary to avoid exceedance of the MFL criteria over the short-term (next 10-15 years) and reduce occurrence of significant harm to the Vallisneria community.
- A number of different flow rate and duration regimes were analyzed with the models to arrive at a favorable combination.
- A flow rate of 300 cfs, extending from November through March is recommended, since less water is required and using the longer application period is more likely to have benefits such as: improved water quality, reduced demands on the Lake, reduction in the occurrence of salt water intrusion and algal blooms in the river. Results of these model simulations indicate that these recommended minimum flow rate and duration provide an acceptable level of resource protection.
- Each year at the onset of the dry season, water supply conditions throughout the District and the status of *Vallisneria* communities within the Caloosahatchee Estuary should be examine to determine if there is a need to make minimum flow releases to the estuary.
- Specific operational procedures are proposed in this plan to meet Caloosahatchee estuary MFLs based on maintaining an average monthly discharge of 300cfs.

Long-Term Recovery Strategy

- Proposed future development of water resources within the Caloosahatchee watershed will be designed to reduce the watershed's reliance on Lake Okeechobee water while providing optimal dry season flows to the estuary nearly every year.
- The future year “2020 with Restudy” scenario includes the following elements (a) a 10,000 acre reservoir, (b) Aquifer Storage and Recover wells, and (c) backpumping projects as outlined in the Comprehensive Everglades Restoration Plan.
- The schedule for construction of these facilities indicates that construction of the reservoir and ASRs is scheduled to begin in 2005 and be completed in 2012. Construction of the backpumping facilities is planned to begin in 2012 and be completed in 2016.
- Results of the model simulations show that once the proposed facilities are operational, MFL flow requirements for the Caloosahatchee estuary will be met. Using the definitions of harm and significant harm provided in this report, flows delivered to the estuary under 2020 with Restudy conditions result in only one exceedance of the significant harm criteria, and two exceedances of the harm criteria, over the 31-year simulation. (Watch this space for future content)